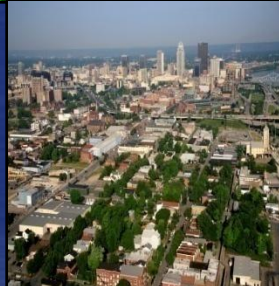




# Air Quality 101



Presented by  
Lauren Anderson  
March 30, 2010



**Part I:**  
**Identifying the Problem**  
**1940 - 1970**



1945

**Louisville  
Smoke  
Commission  
established**

1940

1948

Temperature inversion traps air pollution over Donora, PA killing 21 people



1952



Killer fog in London kills 4,000 and brings international attention to air pollution

1952

Air Pollution Control District of Jefferson County established

1955

Federal Air Pollution Control Act passed

1956



APCDJC conducts pioneering 2 year Air Quality Study in Louisville

1960

Federal Air Pollution Control Act amended

1962



Silent Spring is published and makes the connection between human activity and environmental consequences

1963

First Clean Air Act passed



1966

Kentucky Air Pollution Control Commission established

1966



Temperature inversion traps air pollution over New York City killing 168

1967

Clean Air Act amended

1970

Clean Air Act amended to require attainment with National Ambient Air Quality Standards (NAAQS)

1970

Environmental Protection Agency established



1970

# Air Pollution Control in Louisville

## Ahead of its time

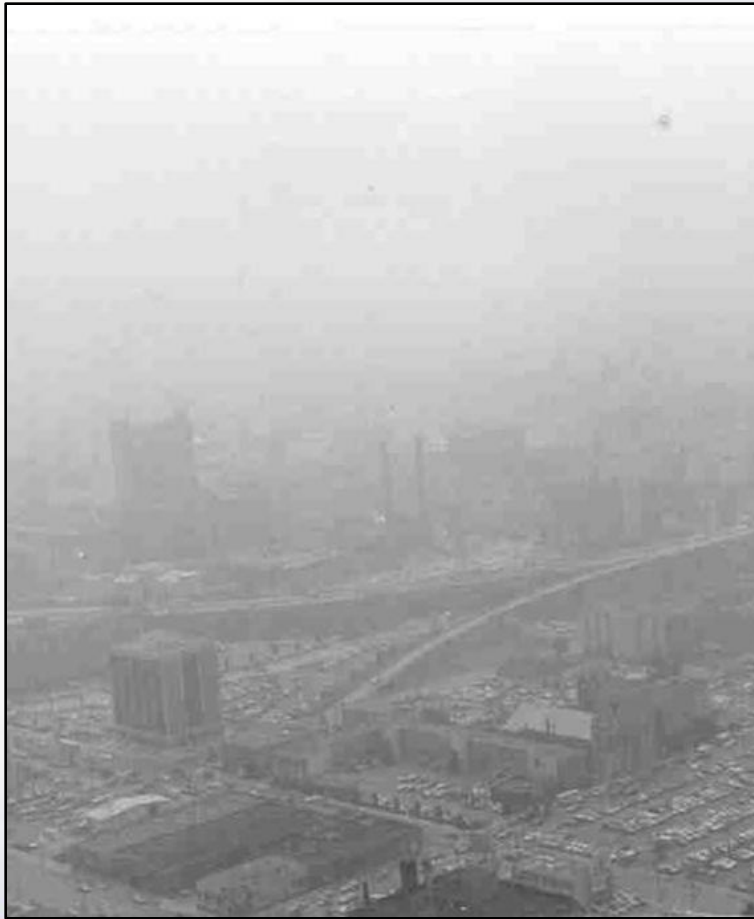
1945 - Louisville Smoke Commission established

- Created in response to air pollution from widespread coal use to fuel the city
- Investigated and reported on problems of smoke from industrial stacks and apartment chimneys
- Measured pollution with buckets suspended from lampposts
- Renamed Air Pollution Control Commission in 1951



Smoke over downtown Louisville 1943

# Clean Air Act of 1970



Louisville Skyline August 1973

- EPA was established to administer environmental laws
- Congress passed the CAA to protect air quality and public health
- Section 108 of the CAA requires EPA to:
  - Identify criteria pollutants
  - Set National Ambient Air Quality Standards (NAAQS) for the criteria pollutants



# Criteria Pollutants

- Endanger public health and welfare
- Come from a variety of sources
- Common throughout the United States

Carbon Monoxide

Lead

Sulfur Dioxide

Oxides of Nitrogen

Ozone

Particulate Matter

# Carbon Monoxide

- What is it?
  - A colorless, odorless and tasteless gas formed when carbon in fuel is not burned completely
- Where does it come from?
  - Vehicles
  - Lawn mowers and other gasoline powered equipment
  - Wood burning
  - Portable and back-up generators
  - Metal processing
  - Chemical manufacturing



# Lead

- What is it?
  - A metal found naturally in the environment and in manufactured products that is harmful to humans when inhaled or ingested
- Where does it come from?
  - Lead smelters
  - Metal processing plants
  - Incinerators
  - General aviation fuel





# Sulfur Dioxide

- What is it?
  - A highly reactive gas
  - Contributes to the formation of fine particle pollution and acid rain
- Where does it come from?
  - Power plants
  - Coal fired processes
  - High sulfur diesel use
  - Industrial processes



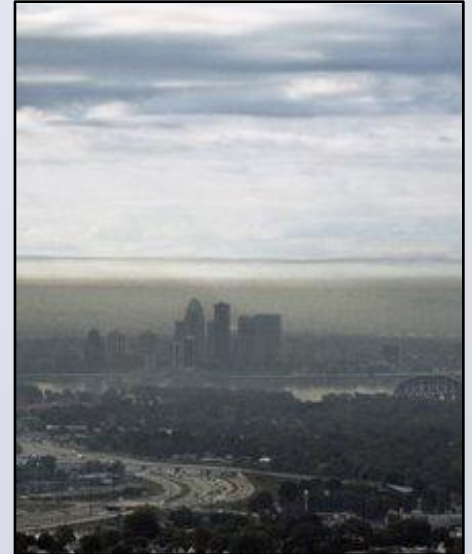
# Oxides of Nitrogen



- What is it?
  - A group of highly reactive gasses that includes nitrous acid, nitric acid and nitrogen dioxide ( $\text{NO}_2$ )
  - $\text{NO}_2$  is the indicator pollutant for the group
  - Contributes to the formation of ground-level ozone, fine particle pollution, and acid rain
- Where does it come from?
  - Vehicles
  - Power plants
  - Nonroad equipment

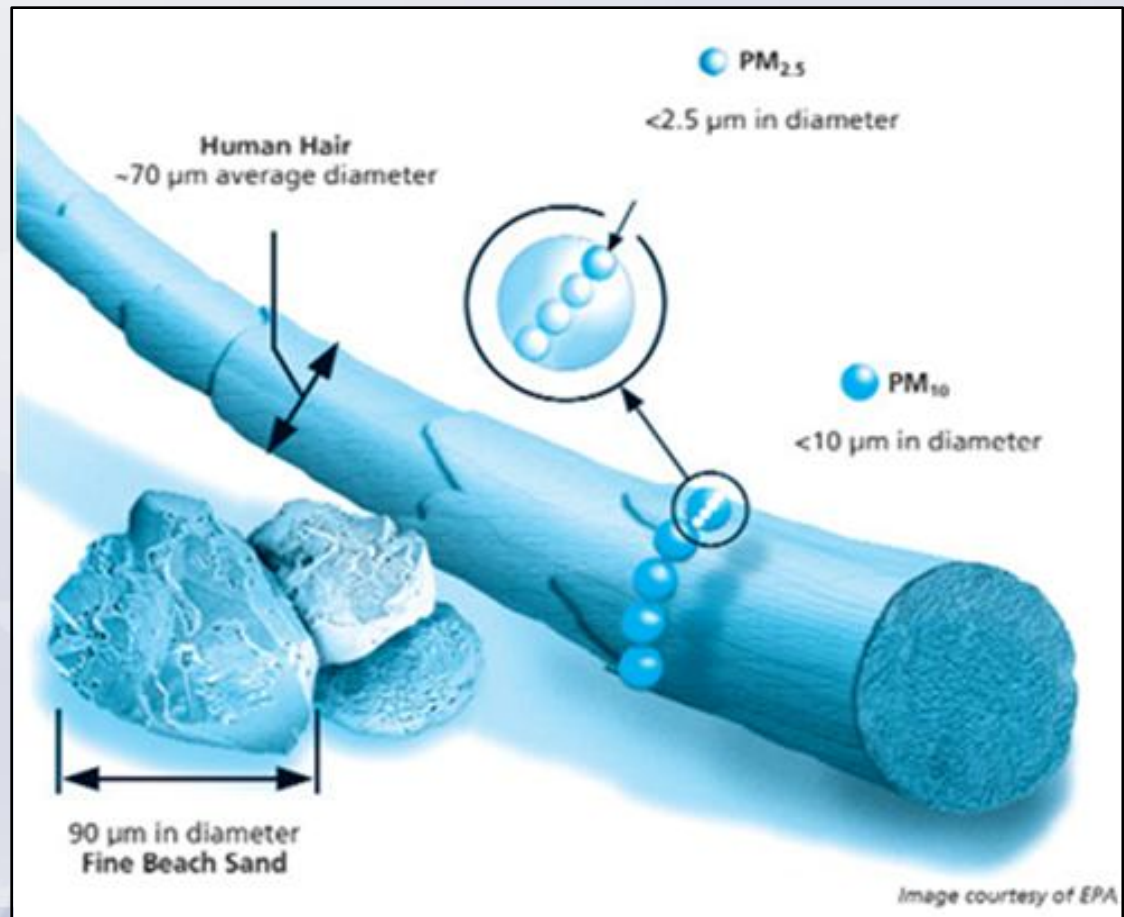
# Ozone

- What is it?
  - A chemical reaction between oxides of nitrogen ( $\text{NO}_x$ ), volatile organic compounds (VOC), heat and sunlight creates ground-level ozone, or smog
- Where does it come from?
  - Vehicles
  - Gasoline vapors
  - Chemical solvents
  - Surface coatings
  - Natural sources



# Particulate Matter

- What is it?
  - A complex mixture of particles and liquid droplets found in the air
  - Categories:
    - Coarse Particles ( $PM_{10}$ )
    - Fine Particles ( $PM_{2.5}$ )





# Particulate Matter



- Where does it come from?
  - Primary Emissions are directly emitted from a source
    - Diesel vehicles and equipment
    - Construction sites
    - Unpaved roads
    - Smokestacks
    - Wood burning
  - Secondary Emissions are formed when gases, such as  $\text{SO}_2$  and  $\text{NO}_x$ , react in the air
    - Power plants
    - Industrial processes
    - Vehicles



# **Part II:**

## **Air Pollution Control**

### **1971 - 1990**



**1973**

Phase out of lead in gasoline begins

**1975**

CAFE standards are issued

**1976**

Toxic Substances Act passed

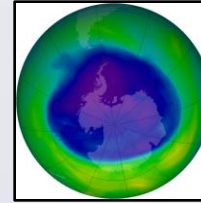
**1979**

KY General Assembly adopts resolution that state regulations be no more stringent than federal standards



**1984**

Union Carbide releases toxic gases at plant in Bhopal, India killing thousands



**1988**

U.S. ratifies the Montreal Protocol on Substances That Deplete the Ozone Layer

**1990**

Clean Air Act amended to include the Title V program, new source review, MACT standards, etc.

1971

1990

**1974**

Clean Air Act amended

**1975**

First catalytic converters are used to reduce CO and hydrocarbons

**1976**

Voluntary Pollutant Standards Index (PSI) established

**1977**

Clean Air Act amended

**1984**

Vehicle Emission Testing begins in Louisville



**1986**

National Academy of Sciences reports that burning fossil fuels is linked to acid rain

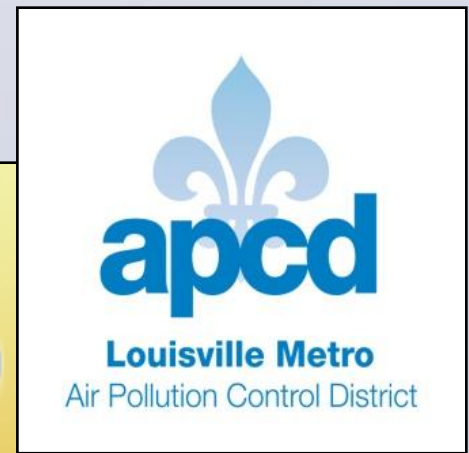
**1989**

EPA releases first Toxic Release Inventory data

# Clean Air Act

## Attaining the Standards

- EPA sets standards (NAAQS)
- State and local air quality agencies:
  - Monitor air quality
  - Maintain an inventory of emissions
  - Develop emission reduction measures to attain the standards

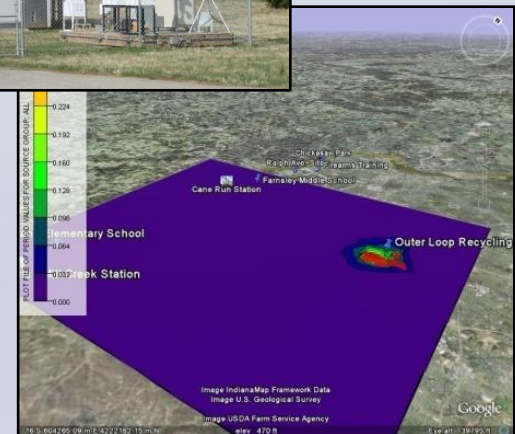


# APCD Functions



# Collect Information

- Monitor ambient air quality
  - Criteria pollutants
  - Toxics
- Inventory emissions
  - Point sources
  - Area sources
  - Mobile sources
- Model emissions
  - Point sources
  - Area sources
  - Mobile sources





# Make Rules

- Support the Air Pollution Control Board
- Coordinate the rulemaking process
  - Develop new regulations
  - Revise regulations
- Issue Permits
- Update State Implementation Plan for Jefferson County
- Administer the Strategic Toxic Air Reduction (STAR) program

# Enforce Rules

- Inspect sources
  - Permitted sources
  - Gas Stations
  - Dry Cleaners
  - Auto Body Shops
  - Asbestos
- Investigate complaints
- Issue violation
- Assess penalties
- Litigate when settlements cannot be reached



# Educate and Assist



- Provide community outreach programs
  - Kentuckiana Air Education (KAIRE) Program
  - Lawn Care for Cleaner Air (LCCA) Program
- Assist businesses with air quality issues
  - Compliance assistance
  - Development plan review
- Apply for grant funding
  - National Clean Diesel Funding Assistance Program
  - P.O.W.E.R. Loan Program
- Facilitate stakeholder involvement
  - NAAQS attainment efforts
  - Emission reduction efforts
- Participate in community initiatives
  - Partnership for a Green City
  - Kentucky Clean Fuels Coalition
  - Community of Trees
  - Kentucky Asthma Partnership

**Part III:**  
**Fine Tuning Emission**  
**Reductions**  
**1991 - 2010**

1991		2010	
1993	Stage II vapor recovery program begins at Louisville gas stations	1995	Reformulated gasoline is required in Louisville
1994	Louisville adopts regulation to require reasonably available control technologies for NOx	1995	Phase I of EPA's Acid Rain Program is implemented
1997	Air Pollution Control Board approves plan to reduce VOC's by 15% to achieve 1-hour ozone standard in Louisville	1999	Air Quality Index (AQI) is developed to report current and forecasted air quality
2000	Phase II of EPA's Acid Rain Program is implemented	2003	Louisville's Vehicle Emission Testing program ends
2004	EPA issues the Clean Air Nonroad Diesel Rule to reduce emissions from nonroad diesel equipment	2005	Louisville is redesignated attainment for 1997 8-hr ozone standard
2007	EPA issues the Heavy-Duty Highway Rule to reduce emissions from onroad diesel vehicles	2008	EPA strengthens ozone and fine particle standards
2009	EPA proposes to strengthen SO <sub>2</sub> standards	2010	EPA proposes to strengthen ozone standards





# NAAQS Attainment

## March 2010 Status

Pollutant	Standard	Averaging Time	Attainment Status
Carbon Monoxide	9 ppm	8-hour	Attainment
	35 ppm	1-hour	Attainment
Lead	0.15 $\mu\text{g}/\text{m}^3$	Rolling 3-Mo Average	Attainment
	1.5 $\mu\text{g}/\text{m}^3$	Quarterly Average	Attainment
Nitrogen Dioxide	0.053 ppm	Annual Average	Attainment
	0.10 ppm	1-hour	Attainment
Particulate Matter (PM10)	150 $\mu\text{g}/\text{m}^3$	24-hour	Attainment
Particulate Matter (PM2.5)	15.0 $\mu\text{g}/\text{m}^3$	Annual Average	Nonattainment
	35 $\mu\text{g}/\text{m}^3$	24-hour	Attainment
Ozone	0.08 ppm	8-hour	Attainment
Sulfur Dioxide	0.03 ppm	Annual Average	Attainment
	0.14 ppm	24-hour	Attainment

# Emission Reduction: 1970 - present



**1973** Phase out of lead in gasoline begins

**1975** CAFE standards are issued



**1984** Vehicle Emission Testing begins in Louisville

**1993** Stage II vapor recovery program begins at Louisville gas stations

**1995** Phase I of EPA's Acid Rain Program is implemented

**1996** EPA bans the sale of leaded gasoline

**2000** Phase II of EPA's Acid Rain Program is implemented

**2005** EPA issues Clean Air Interstate Rule

**2007** EPA issues the Heavy-Duty Highway Rule to reduce emissions from onroad diesel vehicles

1970

1990

2010

**1974** Clean Air Act amended

**1970** Clean Air Act amended to require attainment with NAAQS

**1977** Clean Air Act amended

**1990** Clean Air Act amended to include hazardous air pollutants, the Title V program, new source review, MACT standards, etc.

**1994** Louisville adopts regulation to require reasonably available control technologies for NOx

**1995** Reformulated gasoline is required in Louisville



**1997** Air Pollution Control Board approves plan to reduce VOC's by 15% to achieve 1-hour ozone standard in Louisville

**2004** EPA issues the Clean Air Nonroad Diesel Rule to phase in cleaner diesel engines

**2007** CAFE Standards are strengthened

# NAAQS Revisions

Year	Lead	NO <sub>x</sub>	SO <sub>2</sub>	Ozone	PM	CO
2009	Final					
2010		Final	Proposed	Proposed		
2011					Under Review	Under Review

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# Questions?